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(54) POLARIZING PLATE AND LIQUID CRYSTAL DISPLAY DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To develop a polarizing plate excellent in the strength, dimensional stability, polarizing degree and durability.

SOLUTION: The polarizing plate consists of a stretched film of a polymer film containing a lyotropic liquid crystalline dichroic dye or a lyotropic material containing a dichroic dye. The liquid crystal display device has the polarizing plate on one or both faces of a liquid crystal cell. The film can be aligned in a good state at a small stretching rate.

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(54) 【発明の名称】 偏光板及び液晶表示装置

(57) 【要約】

【課題】 強度や寸法安定性、偏光度や耐久性に優れる偏光板の開発。

【解決手段】 リオトロピック液晶性の二色性色素又は二色性染料含有のリオトロピック性物質を含有する高分子フィルムの延伸フィルムからなる偏光板及びその偏光板を液晶セルの片側又は両側に有する液晶表示装置。

【効果】 少ない延伸倍率で良好に配向させることができる。

【特許請求の範囲】

【請求項1】 リオトロピック液晶性の二色性色素又は二色性染料含有のリオトロピック性物質を含有する高分子フィルムの延伸フィルムからなることを特徴とする偏光板。

【請求項2】 請求項1において、高分子フィルムがポリビニルアルコールからなり、片側又は両側に透明保護層を有する偏光板。

【請求項3】 請求項1又は2において、片側又は両側に粘着層を有する偏光板。

【請求項4】 請求項1～3に記載の偏光板を液晶セルの片側又は両側に有することを特徴とする液晶表示装置。

【発明の詳細な説明】

【0001】

【発明の技術分野】 本発明は、強度や寸法安定性、偏光度や耐久性に優れて液晶表示装置等の形成に好適な偏光板に関する。

【0002】

【従来の技術】 従来、偏光板としては、ポリビニルアルコール系フィルムにヨウ素や二色性染料を含有させて一軸延伸したフィルムに透明保護層を設けたものが知られていた。延伸処理は、ヨウ素等を配向させるためであるが、その延伸倍率は通例4倍以上とされる。そのため強度や寸法安定性に乏しい問題点があった。

【0003】 一方、リオトロピック液晶性の二色性色素又は二色性染料含有のリオトロピック性物質のコーティング膜をフィルムで支持した偏光板も提案されている

(特表平8-511109号公報、WO97/39380号公報)。しかしながらコーティング時の剪断力で配向させたものであるためズレ等の配向不良が生じやすく偏光度に乏しい問題点があった。

【0004】

【発明の技術的課題】 本発明は、強度や寸法安定性、偏光度や耐久性に優れる偏光板の開発を課題とする。

【0005】

【課題の解決手段】 本発明は、リオトロピック液晶性の二色性色素又は二色性染料含有のリオトロピック性物質を含有する高分子フィルムの延伸フィルムからなることを特徴とする偏光板、及びその偏光板を液晶セルの片側又は両側に有することを特徴とする液晶表示装置を提供するものである。

【0006】

【発明の効果】 本発明によれば、リオトロピック液晶性の二色性色素や二色性染料含有のリオトロピック性物質の使用により少ない延伸倍率で良好に配向させることができ、強度や寸法安定性、偏光度や耐久性に優れる偏光板を得ることができる。

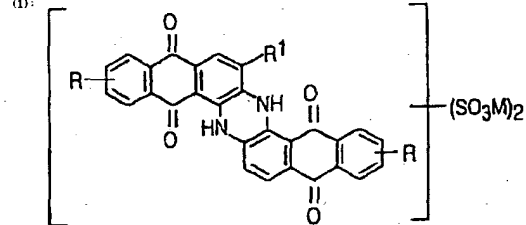
【0007】

【発明の実施形態】 本発明による偏光板は、リオトロピ

ック液晶性の二色性色素又は二色性染料含有のリオトロピック性物質を含有する高分子フィルムの延伸フィルムからなる。そのリオトロピック液晶性の二色性色素、二色性染料含有のリオトロピック性物質としては、従来のコーティング方式による偏光層の形成で使用の適宜なものを1種又は2種以上を用いることができ、特に限定はない。ちなみにその二色性染料含有のリオトロピック性物質の具体例としては、WO97/39380号公報によるものなどがあげられ、商品名：LCポラライザー（Optiva社製）などの市販品もある。

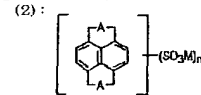
【0008】 一方、リオトロピック液晶性の二色性色素の例としては、式：(クロモゲン)(SO₃M)_nで表される水溶性の有機色素などがあげられ、これはクロモゲンがアゾや多環式化合物等からなって液晶性を付与し、スルホン酸又はその塩が水溶性を付与して全体としてリオトロピック液晶性を示す(特表平8-511109号公報)。ちなみにその具体例としては、下記の式(1)～(7)で表される化合物などがあげられる。

【0009】



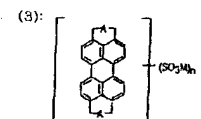
【0010】 前記の式(1)において、R1は水素又は塩素であり、Rは水素、アルキル基、ArNH又はArCONHである。アルキル基としては炭素数が1～4個のもの、就中メチル基やエチル基が好ましく、アリール基(Ar)としては置換又は無置換のフェニル基、就中4位を塩素で置換したフェニル基が好ましい。またMはカチオンであり、水素イオン、LiやNa、KやCsの如き第一族金属のイオン、アンモニウムイオンなどが好ましい(以下同じ)。

【0011】

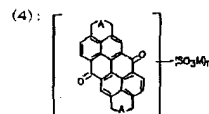
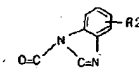


A:

a)



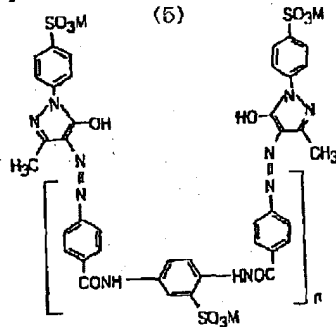
b)



【0012】 前記式(2)～(4)において、Aは式(a)又は(b)で表されるものあり、そのR2は水

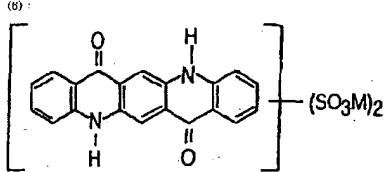
素、アルキル基、ハロゲン又はアルコキシ基、Arは置換又は無置換のアリール基、nは2又は3である。前記のアルキル基は炭素数が1～4個のもの、就中メチル基又はエチル基が好ましく、ハロゲンは臭素又は塩素が好ましい。またアルコキシ基は炭素数が1又は2個のもの、就中メトキシ基が好ましく、アリール基は置換又は無置換のフェニル基、就中、無置換あるいは4位をメトキシ基、エトキシ基、塩素若しくはブチル基で、又は3位をメチル基で置換したフェニル基が好ましい。

【0013】

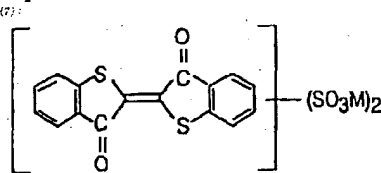


【0014】前記の式(5)において、nは3～5が好ましい。

【0015】



【0016】



【0017】上記の式：(クロモゲン) (SO₃M)_nで表される有機色素は、そのクロモゲンにて安定な液晶相を示し、水やアセトン、アルコール、ジオキサンの如き水溶性有機溶媒に溶解し、その色素の1種又は2種以上を溶解させた例えば固形分濃度が1～20重量%の溶液にて染色処理することができる。

【0018】偏光板の形成は、リオトロピック液晶性の二色性色素又は二色性染料含有のリオトロピック性物質の1種又は2種以上を通例1～20重量%程度の固形分濃度で含有する染色浴に高分子フィルムを浸漬して染色処理した後、それを一軸延伸方式等で延伸処理して二色性色素やリオトロピック性物質を配向させる方式や、予め延伸処理した高分子フィルムに前記の染色浴に準じた溶液を塗布する方式などの従来の延伸型偏光フィルムに

準じた方式などにて行うことができる。延伸倍率は、配向性による偏光度などに応じて適宜に決定しうるが、一般には強度や寸法安定性に優れるものを得る点より4倍以下、就中1.2～3.5倍、特に1.5～2.5倍の延伸倍率とされる。

【0019】高分子フィルムとしては、前記の染色浴で染色処理しうる適宜な透明ポリマーからなるフィルムを用いることができ、特に限定はない。一般には例えばポリビニルアルコールや部分ホルマール化ポリビニルアルコール、部分ケン化エチレン・酢酸ビニル共重合体などの親水性ポリマーよりなるフィルムが用いられ、就中ポリビニルアルコールフィルムが強度や寸法安定性、偏光度や耐久性に優れる偏光板を得る点より好ましく用いうる。高分子フィルムの厚さは、適宜に決定しうるが一般的には光透過率の向上や薄型化などを目的に5～300μm、就中10～200μm、特に20～100μmの厚さとされる。

【0020】前記で得た延伸フィルムの片側又は両側には必要に応じて透明保護層を設けることもできる。透明保護層の形成には、適宜な透明ポリマーからなるフィルムを用いることができ、そのポリマーについて特に限定はない。就中、透明性や機械的強度、熱安定性や水分遮蔽性等に優れると共に、厚さの均一性に優れて位相差の可及的に小さいものが好ましく用いうる。

【0021】ちなみに前記ポリマーの例としては、トリアセチルセルロースの如きアセート系樹脂やポリエステル系樹脂、ポリエーテルスルホン系樹脂やポリカーボネート系樹脂、ポリアミド系樹脂やポリイミド系樹脂、ポリスルホン系樹脂やポリスチレン系樹脂、アクリル系樹脂やポリオレフィン系樹脂、ノルボルネン系樹脂などがあげられ、就中トリアセチルセルロースが好ましい。透明保護層の厚さは、強度等に応じて適宜に決定しうるが、一般には軽量化等を目的に300μm以下、就中5～200μm、特に10～150μmとされる。透明保護層は、微粒子の含有によりその表面が微細凹凸構造に形成されていてもよい。

【0022】本発明による偏光板は、液晶表示装置の形成などに好ましく用いうる。その実用に際しては、例えば液晶セル等の他部材との接着を目的に偏光板の片側又は両側に粘着層を設けた形態や、位相差板等の適宜な光学層の1層又は2層以上と積層した形態などの適宜な構造の光学部材として用いることもできる。位相差板等の光学層との積層は、液晶表示装置の製造過程で順次別個に積層する方式にても行いうるが、予め積層一体化することより光軸のズレ等による品質のバラツキが生じにくく、液晶表示装置の組立効率に優れるなどの利点を有している。

【0023】前記の粘着層には、例えばアクリル系やシリコン系、ポリエステル系やポリウレタン系、ポリエーテル系やゴム系などの適宜なものを用いることができ

特に限定はない。就中、耐熱性や光学特性などの点よりアクリル系のものが好ましく用いられる。粘着層には、必要に応じて例えば天然物や合成物の樹脂類、ガラス繊維やガラスビーズ、金属粉やその他の無機粉末等からなる充填剤や顔料、着色剤や酸化防止剤などの適宜な添加剤を配合することもできる。また微粒子を含有させて光拡散性を示す粘着層とすることもできる。また位相差板等との積層には適宜な接着剤を用いるが、熱応力の抑制による光学特性の維持性などの点よりは粘着層が好ましく用いられる。

【0024】なお前記の光学層には、位相差板のほか例えば防眩層や反射防止層、帯電防止層や光拡散層ないし光拡散制御層、輝度向上層や反射層ないし半透過層などの液晶表示装置の形成に用いられる適宜なものを用いることができる。また上記した透明保護層や粘着層、位相差板等の光学層などの各層は、例えばサリチル酸エステル系化合物やベンゾフェノン系化合物、ベンゾトリアゾール系化合物やシアノアクリレート系化合物、ニッケル錯塩系化合物等の紫外線吸収剤で処理する方式などにより紫外線吸収能をもたせることもできる。

【0025】偏光板を用いての液晶表示装置の形成は、従来に準じて行い。すなわち液晶表示装置は一般に、液晶セルと偏光板及び必要に応じての光学層や照明システム等の構成部品を適宜に組立てて駆動回路を組込むことなどにより形成されるが、本発明においては本発明による偏光板を用いてそれを液晶セルの少なくとも片側に設ける点を除いて特に限定はなく、従来に準じる。

【0026】従って液晶セルの片側又は両側に偏光板を配置した液晶表示装置や、照明システムにバックライトあるいは反射板や半透過型反射板を用いてなる透過型や反射型、あるいは反射・透過両用型などの適宜な液晶表示装置を形成することができる。また液晶セルについても、例えばTN型やSTN型、TFT型や強誘電性液晶型などの任意なものを用い。る。

【0027】

【実施例】実施例1

10 二色性染料含有のリオトロピック液晶水溶液 (Optiva社製、LCポライザー、固形分濃度8.7重量%) からなる染色浴中に厚さ75 μ mの長尺ポリビニルアルコールフィルムを順次連続的に浸漬して染色処理しつつ、ロール延伸機にて長さ方向に2倍の倍率で一軸延伸して偏光フィルムを得た後、その両面に接着剤を介して厚さ80 μ mのトリアセチルセルロースフィルムを接着して偏光板を連続して得た。この偏光板は、波長400~700nmの光に基づいて40%の光透過率、90%の偏光度を示した。

20 【0028】実施例2

2倍に一軸延伸したポリビニルアルコールフィルムの上に前記のLCポライザーを塗布し染色処理して、波長400~700nmの光に基づいて36%の光透過率と84%の偏光度を示す偏光板を得た。

【0029】実施例1、2で得た偏光板を液晶セルに適用して液晶表示装置を形成したところ、優れた偏光特性(二色比)を示すと共に、機械的強度、寸法安定性及び耐久性にも優れた特性を示した。

フロントページの続き

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CLAIMS

[Claim(s)]

[Claim 1] The polarizing plate characterized by the bird clapper from the oriented film of the high polymer film containing the dichroism coloring matter of lyotropic-liquid-crystal nature, or the RIOTORO pick nature matter of dichromatic-dye content.

[Claim 2] The polarizing plate with which a high polymer film has transparent protection layer on one side or both sides by consisting of polyvinyl alcohol in a claim 1.

[Claim 3] The polarizing plate which has an adhesive layer on one side or both sides in a claim 1 or 2.

[Claim 4] The liquid crystal display characterized by having a polarizing plate according to claim 1 to 3 on one side or the both sides of a liquid crystal cell.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] this invention is excellent in intensity, dimensional stability, and degree of polarization and endurance, and relates to the suitable polarizing plate for formation of a liquid crystal display etc.

[0002]

[Description of the Prior Art] Conventionally, what prepared transparent protection layer in the film which the polyvinyl alcohol system film was made to contain iodine and a dichromatic dye, and carried out uniaxial stretching to it as a polarizing plate was known. Although extension processing is for carrying out orientation of the iodine etc., the draw magnification is usually made into 4 or more times. Therefore, the scarce trouble was in intensity or dimensional stability.

[0003] On the other hand, the polarizing plate which supported the dichroism coloring matter of lyotropic-liquid-crystal nature or the coating film of the RIOTORO pick nature matter of dichromatic-dye content with the film is also proposed (a ***** No. 511109 [eight to] official report, WO 97/No. 39380 official report). However, in order to carry out orientation with the shearing force at the time of coating, it was easy to produce poor orientation, such as gap, and the scarce trouble was in degree of polarization.

[0004]

[The technical technical problem of invention] this invention makes a technical problem development of the polarizing plate which is excellent in intensity, dimensional stability, and degree of polarization and endurance.

[0005]

[Means for Solving the Problem] this invention offers the polarizing plate characterized by the bird clapper from the oriented film of the high polymer film containing the dichroism coloring matter of lyotropic-liquid-crystal nature, or the RIOTORO pick nature matter of dichromatic-dye content, and the liquid crystal display characterized by having the polarizing plate on one side or the both sides of a liquid crystal cell.

[0006]

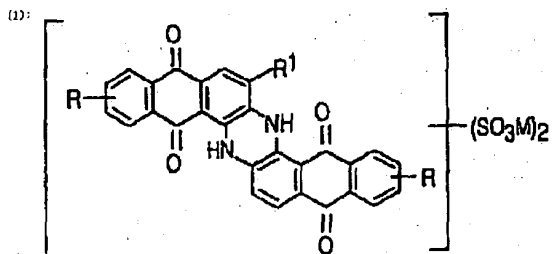
[Effect of the Invention] According to this invention, orientation can be carried out good by few draw magnification by use of the dichroism coloring matter of lyotropic-liquid-crystal nature, or the RIOTORO pick nature matter of dichromatic-dye content, and the polarizing plate which is excellent in intensity, dimensional stability, and degree of polarization and endurance can be obtained.

[0007]

[The operation gestalt of invention] The polarizing plate by this invention consists of an oriented film of the high polymer film containing the dichroism coloring matter of lyotropic-liquid-crystal nature, or the RIOTORO pick nature matter of dichromatic-dye content. As the dichroism coloring matter of the lyotropic-liquid-crystal nature, and RIOTORO pick nature matter of dichromatic-dye content, one sort or two sorts or more can be used for the proper thing of use by formation of the polarization layer by the conventional coating method, and there is especially no limitation. Incidentally, as an example of the RIOTORO pick nature matter of the dichromatic-dye content, what is depended on WO 97/No. 39380 official report is raised, and there is a being [it / a tradename: LC polarizer (product made from Optiva)] marketing article.

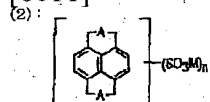
[0008] On the other hand as an example of the dichroism coloring matter of lyotropic-liquid-crystal nature, the water-soluble organic coloring matter expressed with formula: (chromogen) (SO₃M) n is raised, a chromogen consists of azo, a polycyclic compound, etc., mesomorphism is given, a sulfonic acid or its salt gives water solubility, and this shows lyotropic-liquid-crystal nature as a whole (***** No. 511109 [eight to] official report). The compound incidentally expressed with following formula (1) - (7) as the example is raised.

[0009]



[0010] In the aforementioned formula (1), R₁ is hydrogen or chlorine and R is hydrogen, an alkyl group, ArNH, or ArCONH. as an alkyl group -- a carbon number -- 1-4 things -- a methyl group and an ethyl group are desirable above all, and the phenyl group which is not replaced [substitution or] and the phenyl group which replaced the 4th place by chlorine above all are desirable as an aryl group (Ar) Moreover, M is a cation and the ion of the first group metal like a hydrogen ion, Li and Na, K, or Cs, an ammonium ion, etc. are desirable (it is below the same).

[0011]

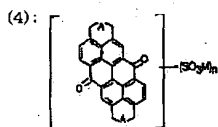
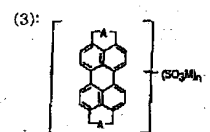
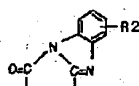


A:

a)

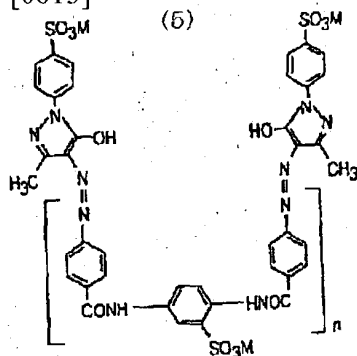


b)



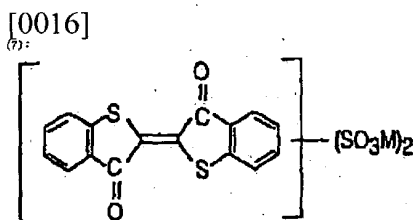
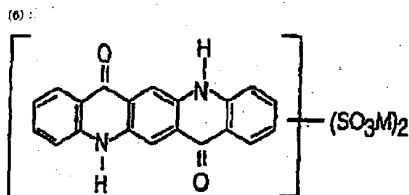
[0012] The aforementioned formula (2) In - (4), those with a thing to which A is expressed with a formula (a) or (b), and its R₂ are [the aryl group which is not replaced / substitution or / and n of hydrogen, an alkyl group a halogen or an alkoxy group, and Ar] 2 or 3. the aforementioned alkyl group -- a carbon number -- 1-4 things -- a methyl group or an ethyl group is desirable above all, and a bromine or chlorine of a halogen is desirable moreover, an alkoxy group -- a carbon number -- 1 or two things -- a methoxy machine is desirable above all and the phenyl group which is not replaced [substitution or] and the phenyl group of an aryl group which is a methoxy machine, an ethoxy basis, chlorine, or a butyl about no replacing or the 4th place, or replaced the 3rd place by the methyl group above all are desirable

[0013]



[0014] As for n, in the aforementioned formula (5), 3-5 are desirable.

[0015]



[0017] The above-mentioned formula: (chromogen) (SO₃M) For example, dyeing processing of the organic coloring matter expressed with n can be carried out with the solution in which the liquid crystal phase stable at the chromogen was shown, it dissolved in the water-soluble organic solvent like water, an acetone, alcohol, and a dioxane, and one sort of the coloring matter or two sorts or more were dissolved and whose solid-content concentration is 1 - 20 % of the weight.

[0018] Formation of a polarizing plate is immersed in the dyeing bath which contains one sort of the dichroism coloring matter of lyotropic-liquid-crystal nature, or the RIOTORO pick nature matter of dichromatic-dye content, or two sorts or more usually by about 1 - 20% of the weight of solid-content concentration in a high polymer film. After carrying out dyeing processing, the method according to the conventional roll polarization films, such as a method to which extension processing of it is carried out by the uniaxial-stretching method etc., and orientation of dichroism coloring matter or the RIOTORO pick nature matter is carried out, and a method which applies the solution according to the aforementioned dyeing bath to the high polymer film which carried out extension processing beforehand, etc. can perform. Although draw magnification can be suitably determined according to the degree of polarization by the stacking tendency etc., let it above all be 1.5 to 2.5 times as many draw magnification as this especially 1.2 to 3.5 times 4 or less times from the point of obtaining what is generally excellent in intensity or dimensional stability.

[0019] The film which consists of proper transparent polymer which can carry out dyeing processing by the aforementioned dyeing bath as a high polymer film can be used, and there is especially no limitation. The film which generally consists of hydrophilic polymer, such as polyvinyl alcohol, partial formal-ized polyvinyl alcohol, and a partial saponification ethylene vinylacetate copolymer, is used, and it can use more preferably than the point of obtaining the polarizing plate a polyvinyl alcohol film excels [polarizing plate] in intensity, dimensional stability, and degree of polarization and endurance above all. Although the thickness of a high polymer film can be determined suitably, especially generally let it above all be the thickness of 20-100 micrometers 10-200 micrometers 5-300 micrometers for the purpose of improvement, thin-shape-izing, etc. of a light transmittance.

[0020] Transparent protection layer can also be prepared in one side or the both sides of an oriented film which were obtained above if needed. The film which consists of proper transparent polymer can be used for formation of transparent protection layer, and there is especially no limitation in it about the polymer. Above all, while excelling in transparency, a mechanical strength and thermal stability, moisture cover nature, etc., it excels in the homogeneity of thickness and a small thing can use preferably as much as possible [phase contrast].

[0021] Incidentally, as an example of the aforementioned polymer, the acetate system resin like a triacetyl cellulose, a polyester system resin, a polyether sulphone system resin and a polycarbonate system resin, a polyamide system resin and a polyimide system resin, a polysulfone system resin and a polystyrene system resin, an acrylic resin, a polyolefine system resin, a norbornene system resin, etc. are raised, and a triacetyl cellulose is desirable above all. Although the thickness of transparent protection layer can be suitably determined according to intensity etc., especially generally it is set to 10-150 micrometers 5-200 micrometers above all 300 micrometers or less for the purpose of lightweight-izing etc. As for transparent protection layer, the front face may be formed in detailed irregularity structure of content of a particle.

[0022] The polarizing plate by this invention can be preferably used for formation of a liquid crystal display etc. On the occasion of the practical use, it can also use as an optical member of proper structures, such as a gestalt which prepared the adhesive layer in one side or the both sides of a polarizing plate, for example for the purpose of adhesion with other members, such as a liquid crystal cell, and a gestalt which carried out the laminating to more than two-layer [of proper optical layers such as a phase contrast board, / one layer or two-layer]. Although the method which carries out a

laminating separately one by one in the manufacture process of a liquid crystal display can also perform the laminating with optical layers, such as a phase contrast board, it is hard to produce the variation in the quality by gap of an optical axis etc. from carrying out laminating unification beforehand, and it has an advantage, such as excelling in the assembly efficiency of a liquid crystal display.

[0023] Proper things, such as acrylic, a silicone system, a polyester system and a polyurethane system, a polyether system, and a rubber system, can be used for the aforementioned adhesive layer, and there is especially no limitation in it. Above all, an acrylic thing is preferably used from points, such as thermal resistance and an optical property. Proper additives, such as a bulking agent which consists of the resins of a natural product or a compost, a glass fiber, a glass bead and a metal powder, other inorganic powder, etc. if needed, a pigment and a coloring agent, and an antioxidant, can also be blended with an adhesive layer. Moreover, it can also consider as the adhesive layer which is made to contain a particle and shows optical diffusibility. Moreover, although proper adhesives can be used for a laminating with a phase contrast board etc., rather than points, such as the maintenance nature of the optical property by suppression of thermal stress, an adhesive layer can use preferably.

[0024] In addition, the proper thing used for formation of liquid crystal displays, such as an acid-resisting layer, others, for example, an anti-glare layer, an antistatic layer, an optical diffusion layer or an optical diffusion control layer, an improvement layer in brightness, and a reflecting layer or a transreflective layer, can be used for the aforementioned optical layer. [board / phase contrast] Moreover, each class, such as optical layers, such as the above-mentioned transparent protection layer and the above-mentioned adhesive layer, and a phase contrast board, can also give ultraviolet-absorption ability with the method processed with ultraviolet ray absorbents, such as for example, a salicylate system compound, a benzophenone system compound, a benzotriazol system compound, and a cyanoacrylate system compound, a nickel complex salt system compound.

[0025] Formation of the liquid crystal display using a polarizing plate can be performed according to the former. That is, although a liquid crystal display is formed by assembling suitably component parts, such as an optical layer a liquid crystal cell, a polarizing plate, and as occasion demands and a lighting system, generally, and incorporating a drive circuit etc., in this invention, using the polarizing plate by this invention, there is especially no limitation and it may apply it to the former correspondingly except for the point of a liquid crystal cell prepared in one side at least.

[0026] Therefore, a liquid crystal display with the liquid crystal display which has arranged the polarizing plate on one side or the both sides of a liquid crystal cell, the penetrated type which comes to use a back light or a reflecting plate, and a transreflective type reflecting plate for a lighting system, proper reflected type or type both for reflection / transparency, etc. can be formed. Moreover, also about a liquid crystal cell, what has TN type, a STN type, an arbitrary TFT type, an arbitrary ferroelectric liquid crystal type, etc. can be used, for example.

[0027]

[Example] A long polyvinyl alcohol film with a thickness of 75 micrometers is continuously immersed one by one during the dyeing bath which consists of lyotropic-liquid-crystal solution (the product made from Optiva, LC polarizer, 8.7 % of the weight of solid-content concentration) of example 1 dichromatic-dye content. After carrying out uniaxial stretching in the length direction for the scale factor of double precision in the roll drawing machine and obtaining a polarization film, carrying out dyeing processing, the triacetyl-cellulose film with a thickness of 80 micrometers was pasted up on the both sides through adhesives, and the polarizing plate was obtained continuously. This polarizing plate showed 40% of light transmittance, and 90% of degree of polarization based on light with a wavelength of 400-700nm.

[0028] The aforementioned LC polarizer was applied on the polyvinyl alcohol film which carried out uniaxial stretching to the 22 times as many example as this, dyeing processing was carried out, and the polarizing plate in which 36% of light transmittance and 84% of degree of polarization are shown based on light with a wavelength of 400-700nm was obtained.

[0029] When the liquid crystal display was formed in the liquid crystal cell with the application of the polarizing plate obtained in the examples 1 and 2, while the outstanding polarization property (dichroic ratio) was shown, the property excellent also in a mechanical strength, dimensional stability, and endurance was shown.

[Translation done.]